Affix label with Candidate Code Number here.
If no label, enter candidate Number if known

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No. 9195

Plumbers, Gasfitters and Drainlayers Board

REGISTRATION EXAMINATION, JUNE 2010

CERTIFYING PLUMBER

QUESTION AND ANSWER BOOKLET

Time allowed THREE hours

INSTRUCTIONS

Check that the Candidate Code Number on your admission slip is the same as the number on the label at the top of this page.

Do not start writing until you are told to do so by the Supervisor.

Total marks for this examination: 100.

Write your answers and draw your sketches in this booklet. If you need more paper, use pages 21–25 at the back of this booklet. Clearly write the question number(s) if any of these pages are used.

All working in calculations must be shown.

Candidates are permitted to use the following in this examination:

Drawing instruments, approved calculators

The following are NOT permitted in the examination room:

Any publications, Acts, Regulations, Codes of Practice, or Standards

Check that this booklet has all of 21 pages in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION

QUESTION 1

(a) Some companies have a health and safety representative. The health and safety representative is required to be skilled/trained in certain aspects of the Health and Safety in Employment Act.

List SEVEN of these aspects.

1 _____

_____

2 _____

_____

3 _____

_____

4 _____

_____

5 _____

_____

6 _____

_____

7 _____

_____

(7 marks) ☐

(b) State the purpose of the Water Supplies Protection Regulations.

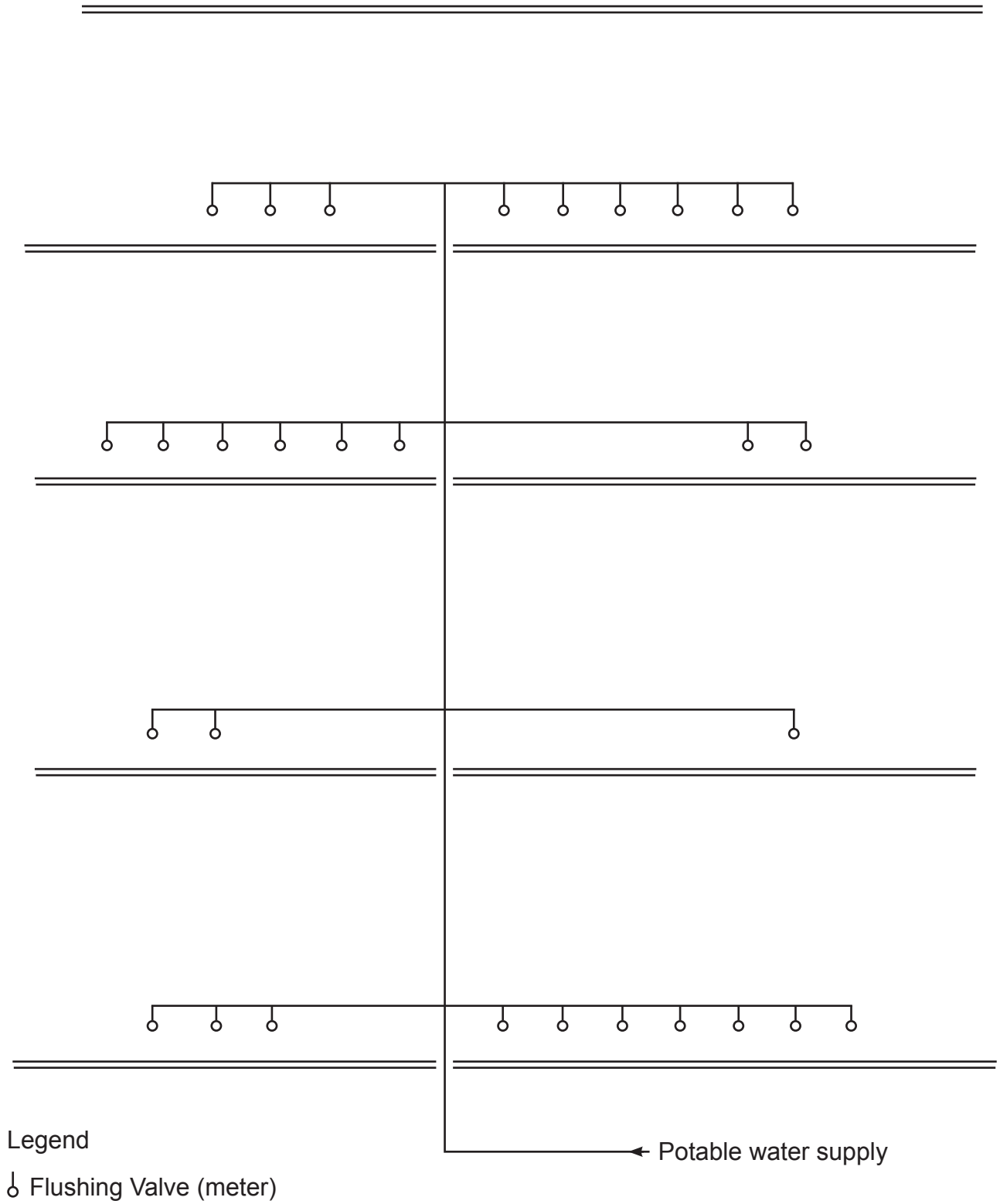
_____

(1 mark) ☐

Total 8 marks ☐

QUESTION 2

The schematic drawing below shows the layout of flushing valves (meters) in a four storey building. The flushing valves are supplied directly from a mains pressure potable/drinking water supply.



QUESTION 2 (cont'd)

Using the table below, size the pipework feeding the flushing valves. Write your answers on the schematic drawing, showing the minimum pipe sizes required.

NUMBER OF VALVES	PIPE SIZE (mm)
1	25
2 - 3	32
4 - 12	40
13 - 24	50
25 - 50	65

Total 10 marks

QUESTION 3

(a) A building is to be used for community care. A high level cold water storage tank is to be installed in the building.

List EIGHT requirements that must be met so that the installation complies with the New Zealand Building Code Clause G12/AS1.

1 _____

_____

2 _____

_____

3 _____

_____

4 _____

_____

5 _____

_____

6 _____

_____

7 _____

_____

8 _____

_____

(8 marks)

QUESTION 3 (cont'd)

(b) Twelve residential units are to be constructed on a site with a single water supply.

Using the following formula, calculate the probable simultaneous demand on the water supply. Show all working.

Formula:
$Q = 0.03n + 0.4554\sqrt{n}$

where
Q = flow rate in litres per second
n = number of dwellings

(2 marks)

Total 10 marks

QUESTION 4

(a) State THREE specific requirements or conditions of the Building Act that apply to an Independently Qualified Person (IQP) involved with backflow prevention.

1 _____

_____

2 _____

_____

3 _____

_____

(3 marks)

(b) State how often is it necessary to test a backflow prevention device, and who is required to arrange for the testing.

_____

(1 mark)

(c) State the purpose of air-gap separation in a domestic plumbing system, and state the minimum air-gap required.

_____

_____

(2 marks)

QUESTION 4 (cont'd)

(d) A water supply from a rainwater storage tank is to be interconnected with a potable/drinking water supply provided by the network utility operator.

(i) Give THREE requirements that must be met for the installation to comply with AS/NZS 3500 Part 1: Water services, and give a reason for each requirement.

1 _____

_____

2 _____

_____

3 _____

_____

(3 marks) ☐

(ii) A pipeline from the potable water supply is connected to the rainwater tank for top up purposes.

Give the condition that applies to this installation.

_____

(1 mark) ☐

Total 10 marks ☐

QUESTION 5

(a) An atmospheric vacuum breaker backflow prevention device is to be installed.

State the FIVE specific requirements that must be met regarding the installation.

1 _____

2 _____

3 _____

4 _____

5 _____

(5 marks)

(b) Describe the procedure for testing an atmospheric vacuum breaker.

_____

_____

_____

_____

(2 marks)

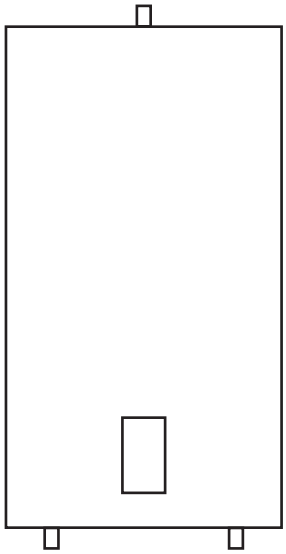
Total 7 marks

QUESTION 6

Draw and label a diagram showing an acceptable design for all the pipework necessary for the efficient operation of an over and under hot water system with a dual energy input (i.e. wet-back and electric storage). The position of the storage water heater has been drawn below as a starter for your sketch.

Your sketch should show:

(i) connections to the storage water heater
(ii) the wet-back heat exchanger
(iii) pipework
(iv) the recommended heights between the storage water heater and the wet-back pipework
(v) venting
(vi) lagging/insulation.



Total 7 marks

QUESTION 7

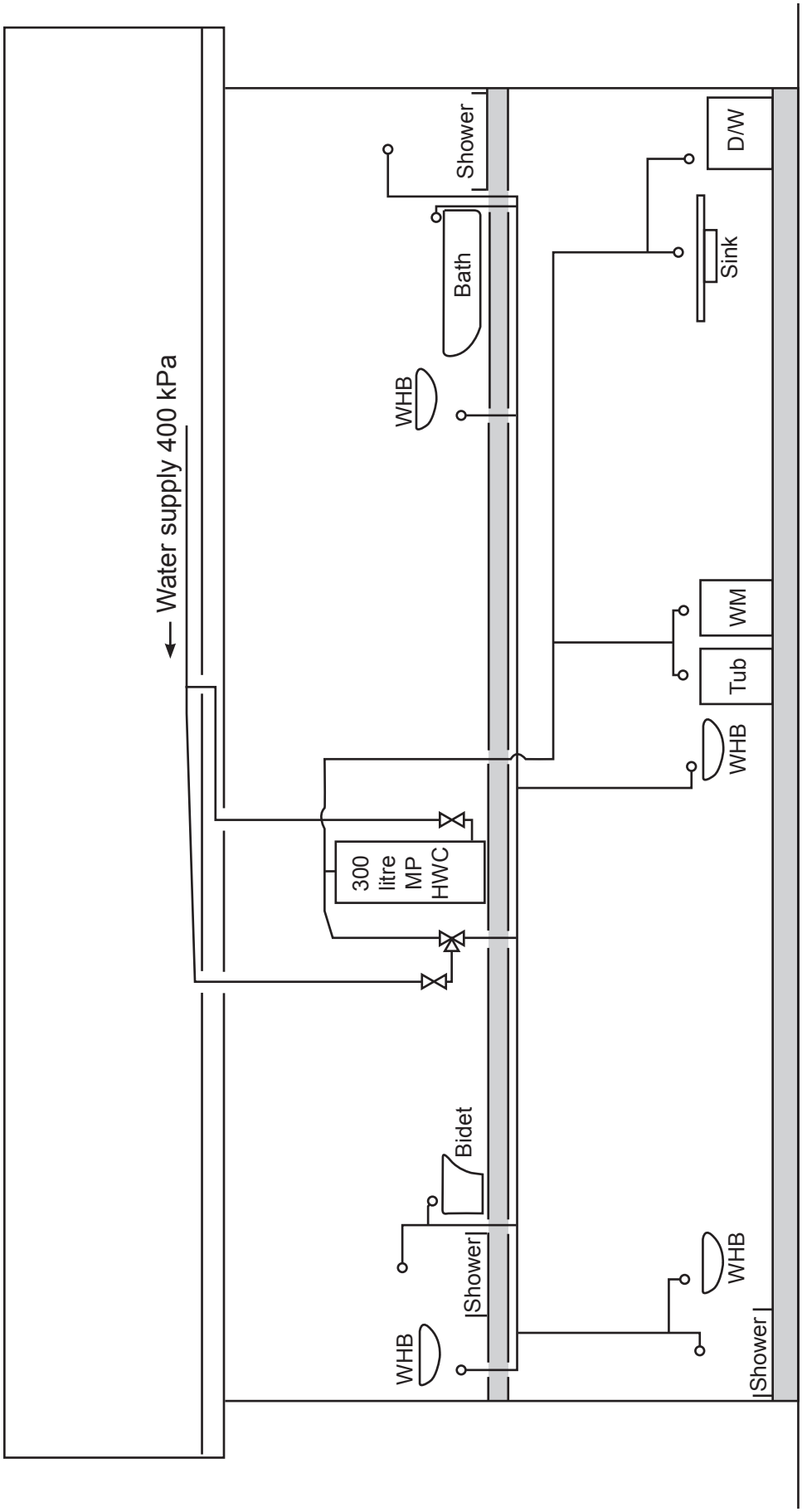
The elevation on page 11 opposite is a cross-sectional view of a two storey house with a low/medium pressure valve-vented hot water service. Pipework and a 300 litre electric hot water storage cylinder are also shown.

Using the table below from the New Zealand Building Code Clause G12/AS1, complete the drawing by providing the minimum pipe sizes to comply with this acceptable solution.

Table 4	Tempering Valve and Nominal Pipe Diameters Paragraphs 5.3.1 and 6.12.1		
	Low pressure (i.e. header tank supply or low pressure)	Low and medium pressure unvented (valve vented) and open vented	Mains pressure
Pressure of water at tempering valve (kPa)	20 – 30	30 – 120	over 300
Metres head (m)	2 – 3	>3 – 12	over 30
Minimum tempering valve size	25 mm (see **Note 3**)	20 mm	15 mm
Pipes to shower	20 mm	20 mm (see **Note 4**)	20 mm (see **Note 5**) (15mm optional) (see **Note 1**)
Pipes to sink/laundry (see **Note 2**)	20 mm	20 mm	15 mm
Pipes to bath (see **Note 2)**	20 mm	20 mm	15 mm
Pipes to basins (see **Note 2)**	15 mm	15 mm	10 mm

Notes:
1. If supplied by separate pipe from storage water heater to a single outlet.
2. This table is based on maximum pipe length of 20 metres.
3. 2 m maximum length from water heater outlet to tempering valve.
4. 15 mm if dedicated line to shower.
5. 10 mm if dedicated line to shower.
6. Table 3 pipe sizes have been calculated to deliver water simultaneously to the kitchen sink and one other fixture.

QUESTION 7 (cont'd)



Total 10 marks

QUESTION 8

(a) When hot water systems are installed to comply with AS/NZS 3500 Part 4: Heated water services, they must be tested hydrostatically.

Give the steps that must be followed in the testing procedure, including the pressure and/or time where appropriate.

(5 marks)

(b) State THREE minimum requirements for pipework laid in, or under, a concrete slab and intended to be used for the conveyance of hot water.

1

2

3

(3 marks)

Total 8 marks

QUESTION 9

(a) Explain the purpose of an untrapped floor waste.

_____

_____

(2 marks)

(b) State THREE requirements that must be met when untrapped floor waste systems are being installed.

1 _____

2 _____

3 _____

(3 marks)

Total 5 marks

QUESTION 10

The diagram opposite shows a range of sanitary fittings connected to a vertical discharge stack on the fifth floor of a ten storey building.
The foul water system for the building is to comply with the minimum requirements of AS/NZS 3500 Part 2: Sanitary plumbing and drainage.
The system is to be a fully vented modified system.
The gradient of all graded discharge pipes is to be 2.5%.
Air admittance valves are not to be used.

(a) On the diagram, draw all group and branch ventilation pipes required.
(b) Using the tables below, size all foul water discharge pipes. Show your answers on the diagram.
(c) Using the tables below, size all ventilation pipes. Show your answers on the diagram.

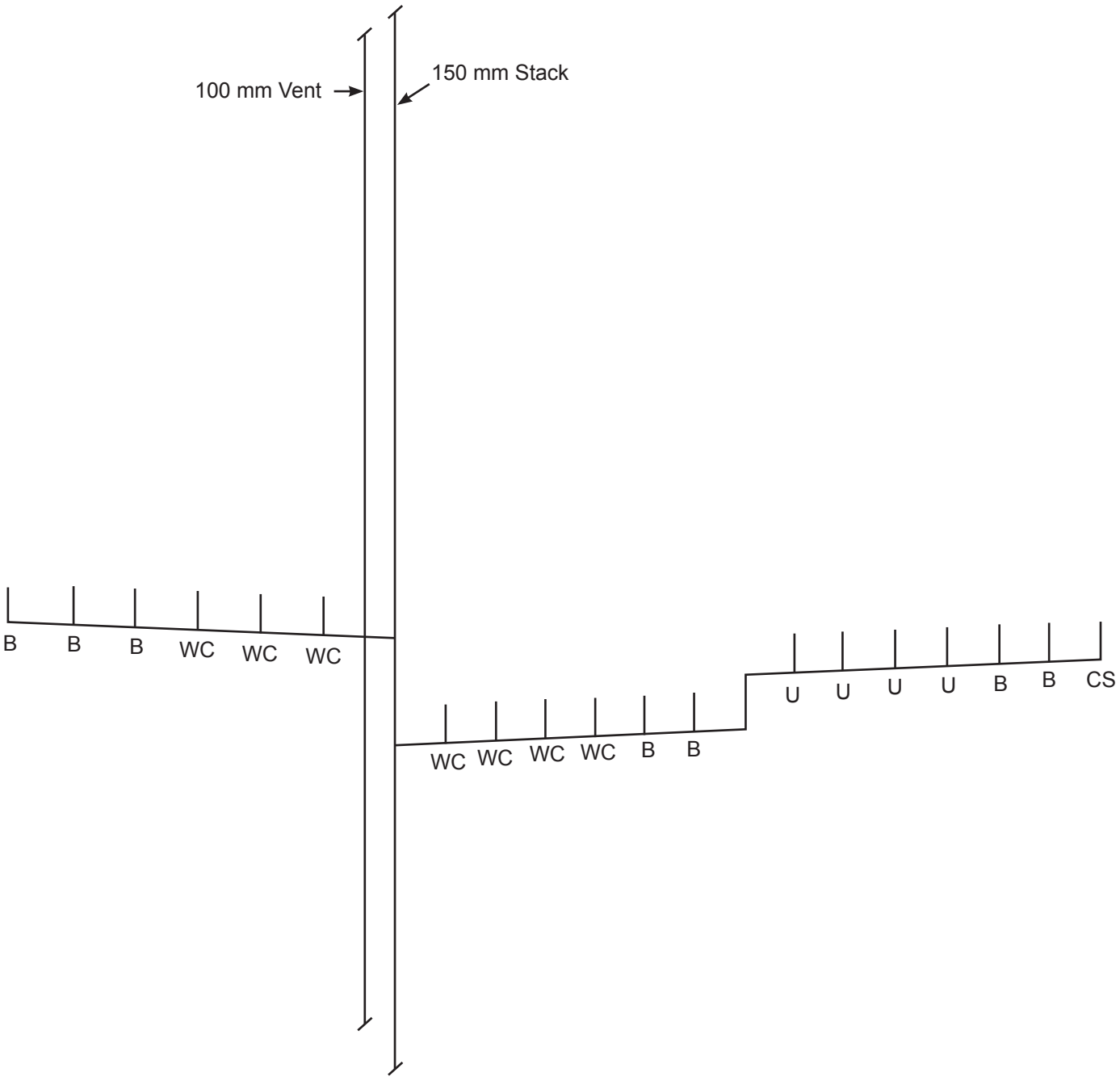
	FIXTURE UNIT RATINGS	
Fixture	Minimum Size of Fixture Discharge Pipe (DN)	Fixture Unit Rating
Basin (B)	40	1
Urinal, wall hung (U)	40	1
Sink, cleaner (CS)	50	1
Water closet pan (WC)	80	6

MAXIMUM FIXTURE UNIT LOADINGS FOR GRADED DISCHARGE PIPES							
	Nominal Size of Pipe (DN)						
Grade %	40	50	65	80	100	125	150
5.00	6	15	51	65	376	953	1959
3.35	5	10	29	39	248	686	1445
2.50	4	8	21	27	182	509	1148
2.00	–	–	–	20	142	410	953

MINIMUM SIZE OF BRANCH VENTS	
Size of branch discharge pipe (DN)	Size of branch vent (DN)
40	32
50	40
65	40
80	50
100	50
150	80

SIZE OF GROUP VENTS	
Size of common discharge pipe (DN)	Size of single group vent (DN)
40	32
50	40
65	40
80	50
100	50

QUESTION 10 (cont'd)



Total 10 marks

QUESTION 11

The diagram opposite shows a single stack system in a ten storey residential building.

Using the tables below, size the foul water pipework and vent so that the system complies with the minimum diameters required by AS/NZS 3500 Part 2: Sanitary plumbing and drainage.

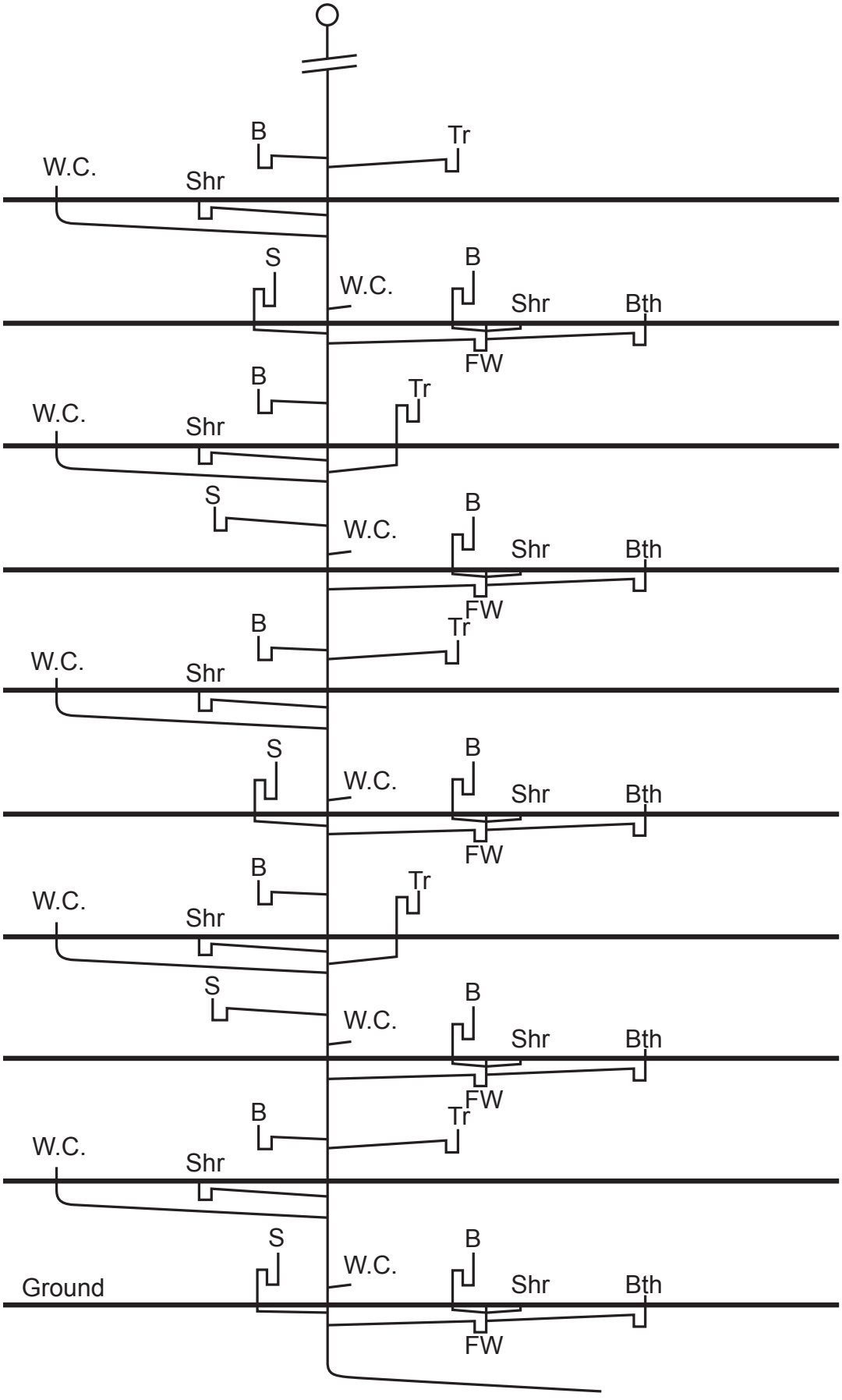
	FIXTURE UNIT RATINGS	
Fixture	Minimum Size of Fixture Discharge Pipe	Fixture Unit Rating
Basin	40	1
Bath	40	4
Sink	50	3
Shower	40	2
Laundry trough	40	5
Water closet (cistern type)	100	4

SINGLE STACK SYSTEMS DOMESTIC OR RESIDENTIAL BUILDINGS		
Size of Stack (DN)	Maximum Fixture Unit Loading	Maximum Number of Consecutive Floor Levels
100	260	10
125	390	15
150	780	30

FLOOR WASTE GULLY OUTLET SIZE	
Maximum Number of Fixture Units Discharging Into Gully Trap	Minimum Nominal Size of Outlet (DN)
3	50
10 (including the discharge from not more than one bath)	65
>10	80

LEGEND
B Basin
Bth Bath
FW Floor waste
S Sink
Shr Shower
Tr Trough
W.C. Water closet

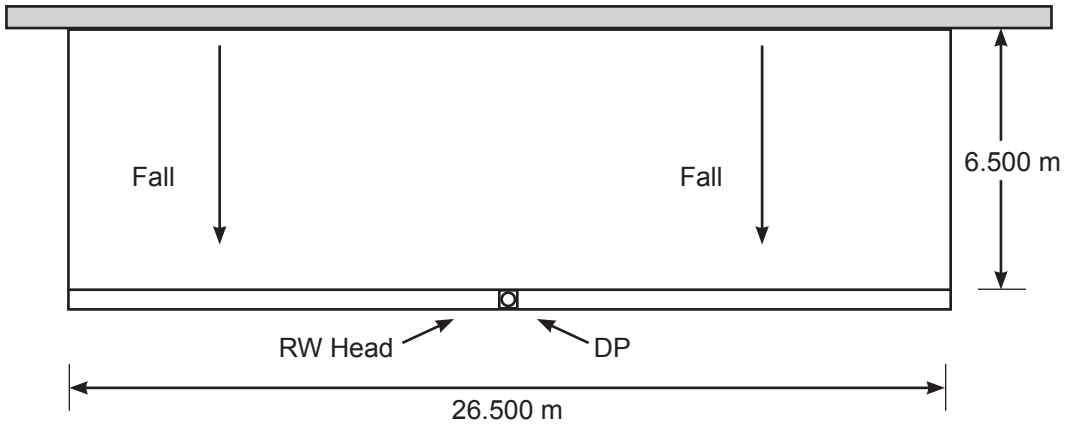
QUESTION 11 (cont'd)



Total 10 marks

QUESTION 12

The following drawing shows a plan view of a lean-to roof with a pitch of 22.5 degrees.



(a) Calculate the volume of water that could be collected off the roof in 4 hours if the rainfall intensity is 12 mm per hour. Show all working.

(2 marks)

(b) Using Table 5 below, find the size of the circular down pipe required.

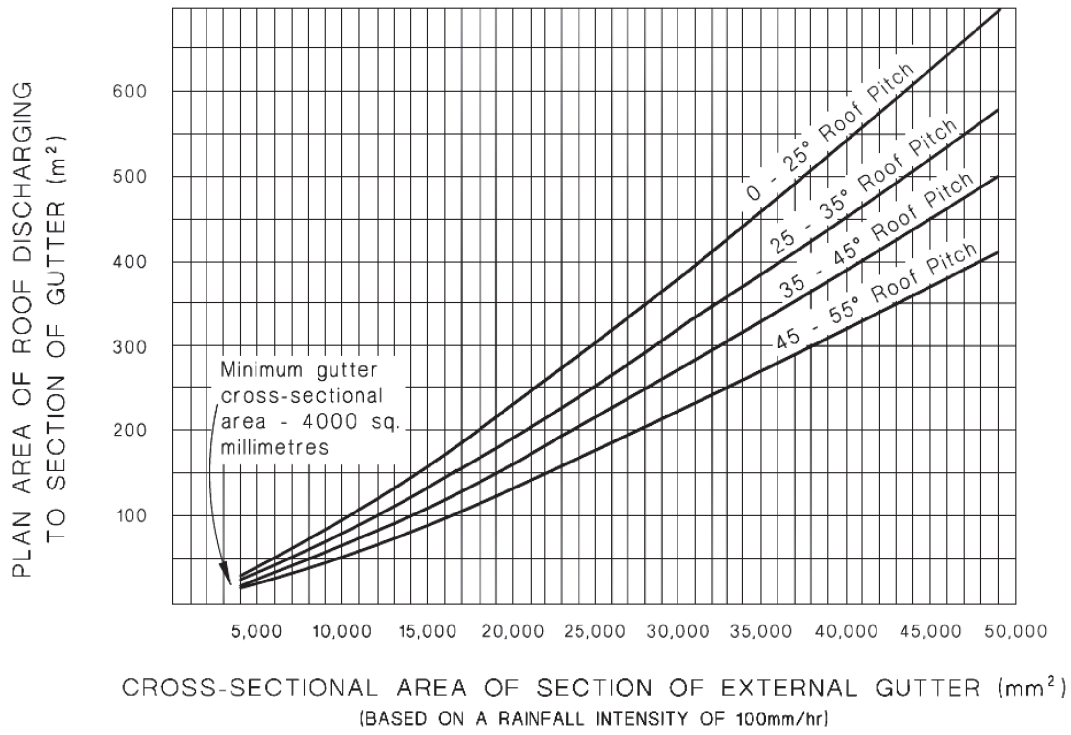
(1 mark)

Table 5	**Downpipe Sizes for Given Roof Pitch and Area** Paragraph 4.2.1			
Downpipe size (mm) (minimum internal sizes)	**Roof pitch** **0-25º**	**25-35º**	**35-45º**	**45-55º**
	Plan area of roof served by downpipe (m^2)			
63 mm	60	50	40	35
74 mm diameter	85	70	60	50
100 mm diameter	155	130	110	90
150 mm diameter	350	290	250	200
65 x 50 rectangular	60	50	40	35
100 x 50 rectangular	100	80	70	60
75 x 75 rectangular	110	90	80	65
100 x 75 rectangular	150	120	105	90

QUESTION 12 (cont'd)

(c) Using Figure 15 below, find the cross sectional area of the external gutter required, based on a rainfall intensity of 100 mm per hour.

Figure 15: **Cross-sectional Area of External Gutter**
Paragraphs 5.1.2 and 5.1.3



(2 marks)

Total 5 marks

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Question number

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Question number

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Question number	Marks	Marks
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